A time and motion study of Screening, Brief Intervention, and Referral to Treatment implementation in health-care settings

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Abstract:

Aims: Screening and brief intervention for harmful substance use in medical settings is being promoted heavily in the United States. To justify service provision fiscally, the field needs accurate estimates of the number and type of staff required to provide services, and thus the time taken to perform activities used to deliver services. This study analyzed the time spent in activities for the component services of the substance misuse Screening, Brief Intervention and Referral to Treatment (SBIRT) program implemented in emergency departments, in-patient units and ambulatory clinics. **Design:** Observers timed activities according to 18 distinct codes among SBIRT practitioners. **Setting:** Twenty-six US sites within four grantees. **Participants:** Five hundred and one practitioner–patient interactions; 63 SBIRT practitioners. **Measurements:** Timing of practitioner activities. **Interventions:** Delivery of component services of SBIRT. **Findings:** The mean (standard error) time to deliver services was 1:19 (0:06) for a pre-screen (n = 210), 4:28 (0:24) for a screen (n = 97) and 6:51 (0:38) for a brief intervention (n = 66). Estimates of service duration varied by setting. Overall, practitioners spent 40% of their time supporting SBIRT delivery to patients and 13% of their time delivering services. **Conclusions:** In the United States, support activities (e.g. reviewing the patient's chart, locating the patient, writing case-notes) for substance abuse Screening, Brief Intervention and Referral to Treatment require more staff time than delivery of services. Support time for screens and brief interventions in the emergency department/trauma setting was high compared with the out-patient setting.

Keywords: alcohol | screening and brief intervention | substance misuse | time and motion study

Article:

Introduction

Unhealthy substance use is a major public health concern in the United States. Because many people who engage in harmful substance use receive care in general health-care settings [1], there is an opportunity to identify patients engaging in risky use and to provide them with the appropriate level of care. Major bodies that guide medical decision-making in the United States have promoted implementing screening and brief intervention (SBI) in medical settings.

Since 2003 the Substance Abuse and Mental Health Services Administration (SAMHSA) has funded cooperative agreements with 19 states, two tribal organizations and one US territory to initiate screening, brief intervention and referral to treatment (SBIRT) service delivery for substance misuse within general medical care settings [2]. SBIRT programs universally screen individuals seeking medical care at a host facility, encouraging less harmful habits in those engaging in risky use and providing those who need it with an appropriate level of specialty care [2, 3].

Examples of studies documenting the implementation of SBI in medical settings in the United States include studies in emergency departments (EDs) [4, 5], in-patient units [6] and primary care [7]. SBI for alcohol use in primary care has a strong evidence base [8, 9]. Of the few studies examining SBI for drugs, there is some question as to its effectiveness [10, 11].

Measurement accuracy is particularly important when estimating the time taken for brief activities, such as those used to deliver SBIRT services. For example, overestimating the length of a screen to be 2 minutes instead of 1 minute would double the cost estimate of a screen and thus the whole budget of a universal screening program.

Time and motion studies rely upon trained observers to measure the duration of each activity and, for brief activities, are probably more accurate than using self-report [12]. Although there are no published time and motion studies for screening and brief intervention for harmful substance use or behavioral health interventions similar to SBIRT, this methodology has been used to study other health-care deliveries [12-16].

The existing literature on the costs of SBI has two distinguishing features. First, there is considerable variation in the estimated time to perform a screen (ranging from 1 to 30 minutes) and BI (ranging from 4 to 30 minutes) [17]. It is unclear to what degree this variation reflects differences in study methodology or differences in implementation characteristics such as setting. Secondly, the average time to support services (e.g. reviewing case-notes) is greater than the time to deliver services [18, 19].

The current study uses data from a SAMHSA evaluation to estimate the service-level duration of activities used to conduct and support SBIRT services. These activities include those conducted face-to-face with patients, such as delivering a BI, and those used to support service delivery.

Methods

Participants

Sixty-three practitioners were observed at 26 sites across four SAMHSA SBIRT grantees, comprising three states and one tribal organization in the Southeast, Midwest and Northwest regions of the United States. Services were delivered in three settings: EDs/trauma centers (including the triage, the trauma resuscitation area, the main body of the ED and staff offices), in-patient hospital settings (medical, surgical and psychiatric services) and several types of out-patient hospitals and ambulatory clinics. Across all grantees, 447 405 pre-screens were delivered during the period of the grant. Contextual data on patient flow at a finer level were not available.

Sites were sampled according to patient flow, type of setting, staffing arrangements, patient population characteristics and site and grantee administrator recommendation. Three remote sites with very low patient flow were excluded and both participating programs were included in one grantee (Table 1).

Table 1. Number of sites visited and practitioners observed by setting and grantee.

	Grantee 1			**Grantee 2**			**Grantee 3**			**Grantee 4**		
Site/practitioner	**ED/trauma**	**IP**	**OP**	**ED/trauma**	**IP**	**OP**	**ED/trauma**	**IP**	**OP**	**ED/trauma**	**IP**	**OP**
Sites (n = 26)	4	1	7	0	0	2	2	2	2	1	2	3
Practitioners (n = 63)	6	1	5	0	0	19	14	1	2	4	2	9

ED = emergency department; IP = in-patient; OP = out-patient.

The SBIRT responsibilities of general medical staff—typically nurses—were limited largely to conducting pre-screens. All other SBIRT responsibilities relied upon SBIRT practitioners (e.g. behavioral health coaches), who were hired specifically for the grant and did not have general medical duties. Participation in the study was voluntary, and practitioners gave their consent to being observed.

Observation protocol

The SBIRT process began with a pre-screen to identify patients who should be screened more thoroughly. Pre-screens contained one to four questions about substance use, were conducted at intake (delivered by staff or self-administered by patients) and scored by a facility staff member. The proportion of pre-screens that were positive varied from 7.7% in the in-patient settings to 23.6% in the ED.

Examples of the screen that followed the pre-screen are the Alcohol, Smoking and Substance Involvement Screening Test (ASSIST) and the Alcohol Use Disorders Identification Test (AUDIT) [20-23]. Some patients who screened negative received feedback to reinforce healthy behaviors. Many patients who screened positive received a BI, a short-duration, low-intensity conversation to increase patient awareness of substance use and motivation toward behavioral change. For patients in need of more intensive services, some sites would schedule brief treatment (BT) for a later date in an out-patient clinic. BT was intended to be six to 12 sessions of in-house, structured, cognitive-behavioral or motivational enhancement therapy. Highest-risk patients were referred to treatment (RT). Referral typically involved connecting a patient with external specialty treatment, but there was significant heterogeneity in the way in which this was

performed. Following the patient interaction, the practitioner typically recorded case-notes in an electronic medical record or a separate SBIRT database.

In ED/trauma and out-patient, practitioners were on-site. With the exception of one site, in-patient practitioners were co-located with and split time across the facility's ED. In one site, one1 practitioner was dedicated to the in-patient ward.

During the observation period, practitioners were encouraged to perform their work as usual. Teams of two trained observers followed a single practitioner during his or her work-day. A timing observer timed and recorded activities. The other observer gathered data on SBIRT process of care and content [24].

Before observations occurred, observers were trained and certified. To be certified, trainees listened to a taped interaction, populated the observation instrument and their responses were graded. To ensure data quality additionally during the site visit, at the end of each observed shift the two observers in each team met to discuss and resolve their questions about the preceding observations.

A standardized form was used to record activity start and stop time, code and topic (Supporting information, Appendix S1). In analyses, the 18 activity codes in the form were collapsed into the eight broader categories in Table 2.

Table 2. Activity categories for analysis.

Analysis categories	Component activity codes
SBIRT direct services	This category comprises the core purpose of the SBIRT grant. The seven service codes are pre-screen, full screen, feedback for negative screens only, brief intervention (BI), brief treatment (BT), referral to brief treatment and referral to specialty treatment
SBIRT patient-specific support	This category comprises activities that support service delivery for a specific patient. The four codes are seeking out patients, doing paperwork for certain patients and two on supporting two separate referral services
SBIRT general support	A single activity code captures activities focusing on multiple patients (e.g. reviewing lists of patients to screen)
GPRA administration	Under the Government Performance and Results Act (GPRA), grantees were required to report on metrics. Two activity codes were used for GPRA reporting, distinguishing between when a patient is present (e.g. the GPRA interview) and absent (e.g. GPRA data entry)
Non-SBIRT productive activities	A single activity code captures non-SBIRT work that the practitioner performs that another staff member would otherwise have to perform, thus benefiting the host institution (e.g. getting a blanket for a patient)
Evaluation support	A single activity code captures time the practitioner spends interacting with the observer
Idle time	A single activity code represents the time the practitioner spends not working in any capacity or communicating with the observer (e.g. reading personal e-mails)
Unknown	A single activity code captures all time that the observer could not code. Its inclusion ensures that all practitioner time under observation is accounted for

SBIRT = Screening, Brief Intervention and Referral to Treatment.

The timing observer shadowed one practitioner during the course of his/her duties. The observer recorded the activity and the start and end time of every activity continuously throughout the period of observation. Timing observers used a new form whenever the practitioner changed focus to another patient.

Observers assessed whether patients were asked to wait in an examination room after being engaged for SBIRT, which would incur costs to the facility if the patient occupied space that would be used for productive activities. Practitioners continued to engage patients immediately after finding them and did not keep patients waiting further. The only time patients occupied examination rooms for SBIRT was when speaking to the practitioner. The time escorting patients from one location to another was captured.

For practical reasons, observations were for fewer hours than the practitioner work-day. For this reason, and because practitioners rather than patients were followed, for some patient observations captured downstream SBIRT components (e.g. RT) without having also captured the preceding SBIRT components (e.g. a pre-screen). Thus, more interactions were observed than pre-screens.

Analysis

Data from paper observation forms were entered into a Microsoft Access database by double-key data entry. Data were analyzed using Stata version 12 [25].

Analyses were conducted at the level of the service component and at the level of the shift. Service-level analyses omit all activities that cannot be attributed to a specific patient, such as reviewing lists of patients at the beginning of a work-day. The duration per service component comprised the time spent directly delivering the service and the time spent supporting each service delivery. Average duration per service was computed for direct service components, such as conducting a BI. Because time for service support, such as reviewing case-notes, could not be mapped uniquely to a direct service component, patient-specific support time was allocated to direct service components using a regression model to weight how support time was allocated to service components. A base case assumed that pre-screens had no support time because pre-screens were typically part of the intake process. This assumption was relaxed in a sensitivity analysis. Subanalyses examined (1) the degree to which the specialist/generalist status of the staff delivering a pre-screen was associated with differences in pre-screen duration and (2) the relative impact of interruptions on service delivery duration.

The shift-level analysis examined the distribution of activities across shifts. A practitioner shift was constructed by aggregating the time for all observed activities during the work-day. Practitioners for whom SBIRT was not considered to be a major responsibility and shifts lasting less than 1 hour were excluded from these analyses, leaving 43 practitioner shifts. Estimation at the shift level accounted for all observed activities, including the many activities that could not be reported at the service level. A subanalysis at this level examined the frequency with which a practitioner attempted to interact unsuccessfully with a patient.

Results

Of the 501 practitioner interactions observed (over 213 hours), 294 included the delivery of at least one SBIRT service component and were therefore straightforward patient–practitioner interactions. The remaining 207 were of support activities only.

Table 3. Service-level activities overall and by setting.

	All settings			By setting								
				ED/trauma			In-patient			Out-patient		
Activity	***n***	**Mean service time**	**Mean support time[a]**	***n***	**Mean service time**	**Mean support time[a]**	***n***	**Mean service time**	**Mean support time[a]**	***n***	**Mean service time**	**Mean support time[a]**
Pre-screen[b,c]	210	1:19 (0:06)	–	136	1:18 (0:07)	–	10	2:14 (0:23)	–	64	1:12 (0:10)	–
Full screen[d]	907	4:28 (0:24)	9:30 (1:11)	56	4:30 (0:32)	12:22 (2:06)	12	5:43 (0:58)	10:43 (3:10)	29	3:53 (0:43)	5:42 (1:13)
Feedback	8	1:00 (0:12)	4:57 (1:44)	5	1:06 (0:19)	7:00 (3:58)	1	0:30 (0:00)	7:09 (4:13)	2	0:57 (0:02)	4:30 (3:20)
BI[b]	66	6:51 (0:38)	10:08 (2:03)	35	5:56 (0:43)	16:19 (7:06)	11	9:50 (1:55)	11:49 (3:15)	20	6:49 (1:14)	7:10 (2:30)
BT	6	45:49 (5:57)	13:02 (5:58)	2	36:26 (18:23)	11:46 (7:09)	2	55:13 (3:32)	18:24 (8:47)	2	45:48 (2:12)	5:36 (2:40)
Referral to BT	17	4:36 (1:15)	13:43 (4:25)	11	3:31 (1:22)	23:29 (15:03)	3	4:27 (0:56)	19:31 (10:13)	3	8:42 (5:02)	10:34 (5:25)
RT	5	4:38 (2:00)	19:19 (8:37)	3	6:28 (3:00)	38:25 (23:50)	2	1:55 (0:46)	11:09 (7:19)	0	–	–

FB = Feedback for negative screens; BI = brief intervention; BT = brief treatment; RT = referral to treatment. Time reported in minutes and seconds. Standard errors in parentheses. [a] Patient support time per service derived from a multivariate regression of patient support time against service component indicators. [b] Significant difference between emergency department (ED)/trauma and in-patient service delivery time at the 5% level. [c] Significant difference between in-patient and out-patient service delivery time at the 5% level. [d] Significant difference between ED/trauma and out-patient support time at the 1% level.

Service-level analyses

Table 3 shows the mean time for activities at the service level in minutes and seconds. Mean service time by service component ranged from 1:19 minutes [standard error (SE) = 0:06 minutes] for a pre-screen to 45:49 (SE = 5:57) for a BT. Support time exceeded the amount of time it takes to deliver the service for all services other than BT. The mean support time has a large SE because of the large natural variation in the data. A joint test indicated that setting itself was associated significantly with support time. A separate study on the same grantees and performance sites suggests overall fidelity to protocol for the SBIRT service components [24].

In-patient pre-screens, which were delivered exclusively by SBIRT practitioners, lasted significantly longer than pre-screens in the ED/trauma and out-patient settings ($P < 0.05$), which were delivered by generalist staff and SBIRT practitioners. Screen duration ranged from 3:53 to 5:43 minutes across settings. Support activities took less time in an out-patient setting than in an ED/trauma or in-patient setting, although this relationship was only significant for screens.

BI duration ranged from 5:56 in ED/trauma to 9:50 minutes in in-patient settings, a statistically significant difference ($P < 0.05$). On average, practitioners in ED/trauma spent almost three times longer supporting BI than actually delivering it (16:19 compared to 5:56 minutes).

Other service components—BT, referral to BT and RT—were observed infrequently, and thus the service and support estimates were estimated imprecisely.

Results not presented assess frequencies of direct service activities according to whether they focused upon alcohol only, drug only or alcohol and drug (prescription drug use was not included separately). In out-patient settings, 60% of screens addressed alcohol only and 40% were alcohol and drug. All other activities (e.g. BI) in this setting focused upon alcohol only. In the ED setting, the proportion of alcohol and drugs together was higher than in out-patient settings (e.g. 55% of screens).

Across settings, almost 8% of patient–practitioner interactions were interrupted. Interruptions were usually because medical staff needed to see the patient and occurred most frequently in ED/trauma (13% of patient–practitioner interactions), followed by in-patient (9%) and out-patient (2%) settings. Across all settings, interruptions lasted an average of 2:17 minutes (SE = 0:33) for practitioners, with much of that time idle (59%).

The sensitivity analysis relaxing the assumption of zero support time for pre-screens did not change study conclusions.

Shift-level analyses

Of the 43 shifts, 21 came from ED/trauma settings, four from in-patient settings and 18 from out-patient settings. The average duration of the 43 shifts was 4:35:48 hours (SE = 00:18:22). Across all settings, practitioners spent 13% of their time delivering SBIRT services and 42% of their time supporting it (Fig. 1), or a combined 55% of their time in service provision. As context, in

results not reported, the median number of patients observed per shift across all sites and shifts was 8.0 in ED/trauma, 7.5 in in-patient and 4.5 in out-patient settings.

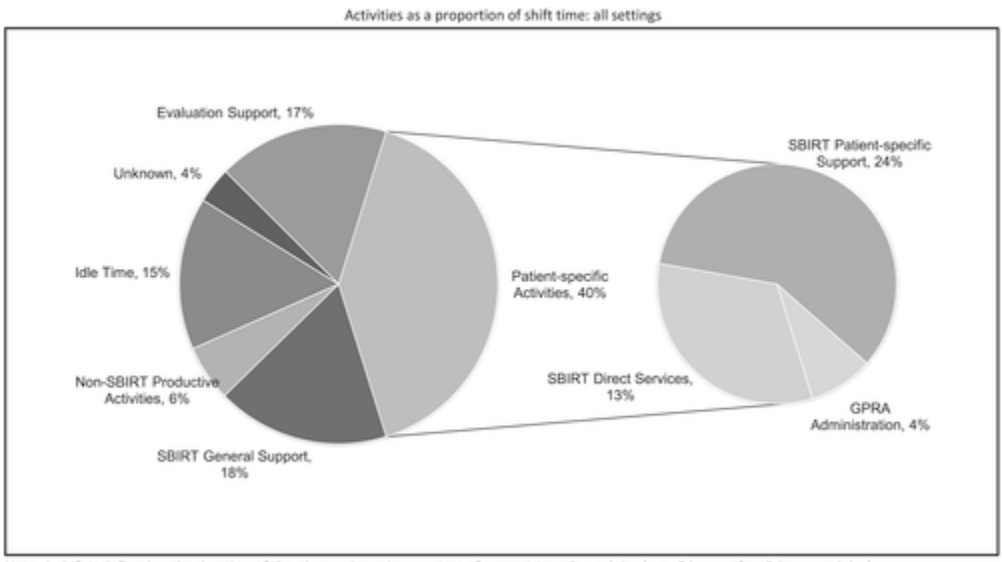

Figure 1. Activities as a proportion of shift time: all settings. A shift is defined as the duration of the observed continuous time of a practitioner's work-day (e.g. 5 hours of an 8-hour work-day)

Activities focusing upon a specific patient, including service delivery, comprised 40% of the average practitioner's time. Grant reporting requirements accounted for 4% of time. This finding somewhat contradicts common anecdotal concerns that grant reporting activities greatly displace clinical activities.

Practitioner time for the eight activities analyzed did not differ significantly across settings (Fig. **2**). Although the differences in means are considerable, statistical inferences cannot be made with confidence because of the small sample size.

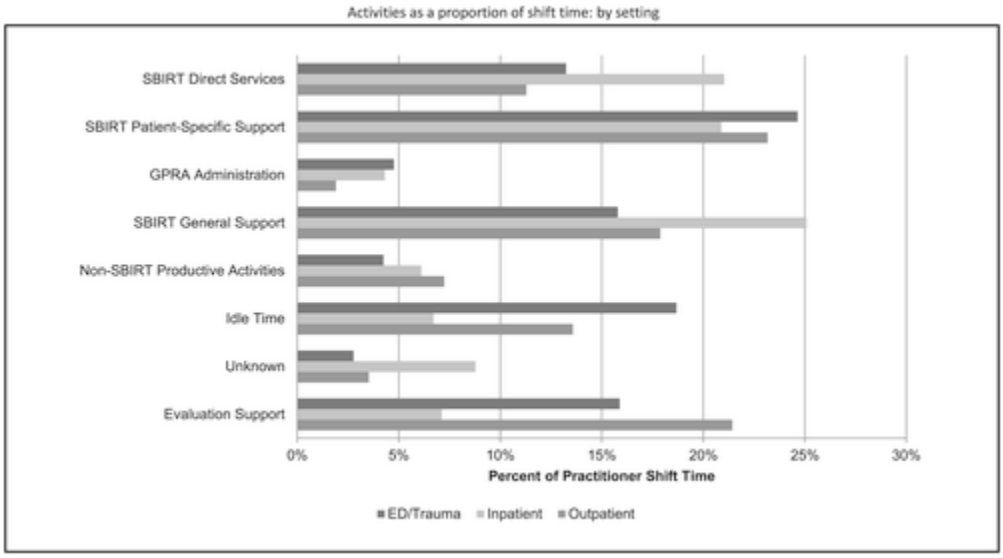

Figure 2. Activities as a proportion of shift time: by setting

Practitioners attempted unsuccessfully to find 83 patients during the observed period of a shift. More than 60% of the shifts had at least one instance of a missed opportunity, which occurred on average nearly every 2 hours (0.48 per hour; SE = 0.10). No significant differences were detected between settings.

Discussion

Like many behavioral health services, SBIRT relies largely upon labor. However, there is scant evidence on the time taken to deliver SBIRT. The current study addresses this gap in the literature by providing detailed estimates of the duration of individual SBIRT service components using data from direct observation.

The estimates fall within the large range of published estimates, based largely in clinical trials [17]. Estimates from a different grantee cohort that used different methods for gathering data are available. Compared to the current study, those estimates are lower for a pre-screen and higher for a screen [26], probably because of differences in the screening instruments that were used between the two cohorts being compared. Estimates of BI service and support duration were similar in the two studies.

The amount of time that practitioners spent delivering services in the current study—approximately 13%—is at the lower end of the range of estimates in the general medical literature: approximately 15% for physicians [16], 34% for nurses [13] and 34.1 and 20.9% for surgeons and internists, respectively [15]. These other studies also concur that support activities require more staff time than the actual delivery of services. When setting reimbursement rates, decision-makers should account for this support time as well as the service delivery time.

The finding that support activities (e.g. checking case-notes) take a relatively large amount of practitioner time has implications for sustaining SBIRT financially. Medicaid is a major potential funding source, with 28 of 50 states activating billing codes under Medicaid as of 2012. Medicaid reimburses physician time in 15-minute increments (non-physician time can be billed under a facility code). Although an average patient would receive a pre-screen, full screen and BI in fewer than 15 minutes of actual service time, an additional 20 minutes would be used on patient-specific support (reviewing the patient's chart, locating the patient, writing case-notes). Future research should address how the support time can be minimized to help ensure that service provision is efficient.

The finding that support time for screens and BI in the ED/trauma setting was high relative to the out-patient setting could probably be because of three reasons. First, the ED/trauma setting is a relatively chaotic environment with a relatively high number of interruptions. Secondly, out-patient facilities are typically smaller in size, allowing staff to locate patients more quickly. Thirdly, out-patient visits are scheduled and thus service flow was relatively predictable. Decision-makers implementing SBIRT in ED/trauma must balance allowing medical staff to provide essential care whenever necessary [5] with meeting screening targets [4, 27].

The current study has at least two major limitations. First, results are for a limited set of observations, particularly in the in-patient setting and for RT, and for programs at one point in time. The results can only apply to other programs that have similar implementation strategies to those studied here. This limitation reflects in part the decision to gather data across several settings and for all components of SBIRT. Mitigating this limitation is that the sample size is similar to that in other time and motion studies in the general medical literature [13, 15, 16].

A second limitation is that practitioners probably modified their behavior while being observed [28]. It is difficult to speculate with confidence how this feature of the study changes the estimates.

Observer bias was probably minor and was mitigated by using a standardized instrument and protocol, training observers and debriefings at the end of every observed shift. Observation team staff were mixed across site visits, reducing the possibility of systematic bias across teams. Finally, observing activities over most of a shift reduced potential bias from unobserved activities affecting observed activities.

The current study findings indicate several areas in which to focus further research. First, more timed observations are needed to improve statistical precision in the in-patient setting. Secondly, more understanding is needed on existing and best practices for RT. There was considerable variation in the way RT was performed in the current study, and the efficacy of RT has been questioned recently [29]. Thirdly, patient acuity should be assessed and correlate with estimates of activity duration. Fourthly, the sample size should be sufficiently large to disaggregate findings by facility type and funding structure.

A final area for further research is to determine how to improve service delivery efficiency while serving as many patients as possible. The estimates of idle time—or non-productive activities—provide a basis for further studying the efficiency of service delivery. Actions that might reduce inefficiencies in SBIRT programs include increasing generalist staff involvement or broadening the role of the specialist SBIRT staff beyond the topic of addressing risky substance use.

Declaration of interests

None.

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